

UNITED STATES PATENT APPLICATION

of

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for

WALL AND FLOOR COVERINGS

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WALL AND FLOOR COVERINGS

BACKGROUND OF THE INVENTION

1. Field of the Invention

5 This invention relates to wall and floor coverings based on a laminate carrier including a fiberglass mat and an organic synthetic non-woven, and to a method of preparing the same.

2. Description of the Related Art

10 Carriers composed of bonded fabrics are useful in roofing felts and insulation. They are particularly useful in wall and floor coverings of constructions such as residential and commercial structures.

15 A floor and wall covering is described in Patent Document WO 98/17455, wherein the covering is manufactured without the use of a carrier. A plastic material in the form of spherically shaped particles are placed on a substrate, such as a conveyor. A band conveyor made of steel is provided on which the spheres are sintered together.

20 Various other laminates employed as floor and wall coverings and their method of manufacturing are known in the art. For example, European Patent Document EP 0 132 325 B1 discloses a method for fixing a surface covering on a bottom covering. A glass mat is used as a carrier  
25 and it is coated with a PVC material.

Patent Document WO 97/19219 A1 discloses a floor covering based on a carrier coated on both sides. European Patent Document EP 0 899 372 A2 simply describes a coated textile glass mat.

5           Some of the disadvantages associated with the carrier laminates described above is the mechanical, dimensional and noise attenuation of these composites when they are used as wall or floor coverings.

10           To meet the requirements of the flooring and insulation industries, it is an object of the invention to provide a wall or flooring carrier laminate based on two or more layers including a fiberglass mat and an organic synthetic fibers non-woven, bound by needling.

15           It is another object of the present invention to provide a wall or floor covering having improved noise attenuation properties, and in particular reduced noise propagation, generated from walking a floor having such a covering.

20           It is a further object of the present invention to provide wall or floor coverings which are high adaptable to thermal changes and provides crack bridging which may occur. Nevertheless, these coverings provide sufficient elasticity.

25           It is yet another object of the present invention to provide a wall or floor covering based on a carrier having improved thermal and dimensional stability,

wherein the carrier is easily reproduced and provides an increased comfort level (i.e., they are soft).

Other objects and aspects of the invention will become apparent upon review of the specification and  
5 claims appended thereto.

#### SUMMARY OF THE INVENTION

In accordance with a first aspect of the invention, wall and floor coverings based on a carrier coated with one or more layers is provided. The carrier includes a  
10 fiberglass containing mat consolidated with a binder, a non-woven made of organic synthetic fibers bounded with the fiberglass containing mat by needling. Part of the organic fibers penetrate through the fiberglass containing mat, and one or more layers coated on a glass  
15 fiber side of said carrier, opposite the non-woven synthetic mat.

In accordance with a second aspect of the invention, a method for manufacturing wall and floor coverings based on a carrier coated with one or more  
20 layers is provided. The process includes providing an organic synthetic fiber or chemical fiber non-woven, and a fiberglass containing mat pre-consolidated with a binder. The mat and the non-woven are bounded by needling such that a portion of the organic synthetic  
25 fibers penetrate through said fiberglass containing mat and optionally a part of the fibers emerges from the side of synthetic fiber non-woven and lies adjacent thereto. One or more layers are coated on the glass

fiber side of the bounded carrier opposite the non-woven organic mat.

DETAILED DESCRIPTION OF THE PREFERRED  
EMBODIMENTS OF THE INVENTION

5           The invention will now be described with reference to the exemplary embodiments thereof. In an exemplary embodiment of the invention, wall and floor coverings based on a carrier coated with one or more layers. The carrier includes a fiberglass containing mat and an  
10   organic synthetic fibers non-woven bound by needling in a manner where part of the synthetic fibers may extend through the entire fiberglass mat, and preferably a part of the organic fiber lie adjacent to the side opposed to the non-woven organic non-woven. The laminate (e.g.,  
15   composite) includes one or more layers coated on the same glass fiber side, opposite the non-woven.

          The synthetic fibers can be staple fiber, but preferably filamentous fibers. These filamentous fibers are also known to those skilled in the art as "endless"  
20   fibers. The fibers are preferably organic synthetic fibers, such as polyester, polypropylene, polyamide or any other suitable chemical or synthetic fibers. Bico fibers can also be utilized.

          The synthetic fibers non-woven can be pre-  
25   consolidated before bonding with the fiberglass mat by hydrodynamically, mechanically or thermal means. In addition, thermal fixation may be performed. Pre-

consolidation can be also performed by a combination of these techniques.

The fiberglass mat is produced according to either the a so-called wet, or dry method, wherein fibers of E, C class, mixture thereof and ECR glass are pre-consolidated through the employment of preferably a water insoluble binder. Suitable binders include acrylate copolymerized with vinyl acetate, styrene, etc. Other suitable binders include acrylic, urea-formaldehyde or melamine formaldehyde, melamine and urea resins. The diameter of the glass fibers is about 8 to 16  $\mu\text{m}$ , and preferably about 10 to 13  $\mu\text{m}$ . The length of the fibers is about 8 to 32  $\mu\text{m}$ . The weight of the glass mat produced is about 30 to 100  $\text{g}/\text{m}^2$ , and preferably about 40 to 70  $\text{g}/\text{m}^2$ . It will readily be recognized by the skilled artisan that up to 40 percent of the glass fibers can be substituted by other fibers. In particular, cellulose based fibers, polyacrylonitrile, polyester, polyamide, etc.

The organic synthetic non-woven of staple fiber can be made on a carding machine, which is well known in the art. Preferably, the filamentous non-wovens are made by the spunbond method described in DE OS 24 60 755 and herein incorporated by reference in its entirety. Several spinning beams or the like are utilized to manufacture the so-called curtains which are laid down on a moving conveyor in a randomly distributed arrangement.

The formed synthetic fiber mat is thermally fixed prior to bonding with the fiberglass mat by either calendering or through the utilization of a hot-air oven. Optionally, the mat is passed through an infra-  
5 red path where the mat is exposed to radiation. In this manner, the thermal shrinking of the non-woven upon formation into a carrier laminate is removed, thereby avoiding a wave formation due to differential shrinkage phenomenon as a result of a subsequent thermal treatment  
10 (i.e., coating of the carrier laminate).

The synthetic fibers may be shrunk separately, and therefore before a non-woven is produced using these shrunk fibers. Preferably, the organic fibers are shrunk when they are present in the form of a non-woven  
15 or in the form of corresponding layers. The shrinking may take place before a mechanical or hydro-dynamical pre-consolidation. Optionally, the non-woven is shrunk after a corresponding pre-consolidation. The shrinking is preferably performed by heating in an oven at  
20 temperatures of about 140 to 220°C.

Upon obtaining the mats, the organic synthetic fibers non-woven is laid on the pre-consolidated fiberglass containing mat where they are mechanically needled together. Needling can be performed such that  
25 the needles penetrate the organic fiber non-woven and press part of the organic fibers through the fiberglass mat in a manner where part of the organic fibers emerge from the fiberglass mat, and optionally are adjacent thereto.

Preferably, the mats are bounded to each other by water beam needling (i.e., hydrodynamically). The needling takes place from the side of the non-woven synthetic, and with an increased water beam pressure.

5 Preferably, the water beam pressure is in the range of about 100 to 400 bar, and even more preferably about 200 to 400 bar. Thus, a part of the fibers or filaments are pushed through the glass mats, while reducing the damage to glass and synthetic fibers. This process is further  
10 described in detail in co-pending application Atty. Docket No. 032745-019 and hereby incorporated by reference in its entirety.

The two layer system needled together can subsequently be provided with a binder, in order to  
15 achieve a final consolidation. In this exemplary embodiment very small amounts of binder are employed. It is preferred that the binder is in a range of about 0 to 25 weight percent, and even more preferably 0 to 10 weight percent. The binder can be selected from the  
20 group including pure acrylates, copolymers of styrene, butadiene, acrylates and mixtures of duroplastic binders such as urea and melamine resins.

Thereafter, the formed carrier laminate is manufactured with one or more polymeric coatings applied  
25 to the fiberglass mat, away from the synthetic non-woven. Polyvinyl-chloride can be employed as a preferred coating. However, other polymers such as acrylates in the form of a paste, polyolefins contained in different kinds of mixtures and reproductive raw



materials like natural resins can be employed. Coating compositions are further described in European Patent Document EP 0 132 325 B1 and Patent Document WO 97/19 219 which are hereby incorporated by reference in their  
5 entirety.

The coating may be placed through several techniques, such as the so-called "spread coating" (barber's knife) or the "calender" technique. In both techniques, a viscous polyvinyl-chloride (PVC) is  
10 pressed into the glass substrate. The coating temperature is dependent on the required viscosity for PVC. Typically a temperature of about 185°C is sufficient in most applications.

The temperature required and the choice of coating materials also depends on the type of synthetic fibers.  
15 For example, polypropylene non-wovens require a temperature lower than 185°C, while polyester non-wovens can be heated to this temperature.

In accordance with the exemplified embodiment,  
20 several coating layers of different physical characteristics, and in particular hardness, can be placed on the carrier laminate. The coatings can in turn be layers, having a pattern or a colored designs. In addition, the outer layer can include embossing on  
25 the outer surface, to prevent slipping or other accidents that may occur. Naturally, the bond between the coatings and carrier is particularly improved where the synthetic fibers penetrate through the fiberglass

mat and are adjacent to the underside of the fiberglass mat which is coated on a side away from the non-woven. The fibers provide an especially improved bond of the covering on the laminated material.

5        It will readily be recognized by those skilled in the art that modifications can be performed on the laminate to vary the physical and/or mechanical properties (e.g., hardness) of the wall and floor coverings. For example, the thickness of the floor and  
10 wall coverings can be varied by varying the thickness of the individual layers (i.e., the organic fibers non-woven and the fiberglass mat). Further, it is possible to vary the thickness of the final product depending on the application in which it is to be used, by varying  
15 the number of coatings and their layers.

In another exemplary embodiment, the wall and floor coverings are manufactured as described-above, no final consolidation with a binder is performed. This process is further described in co-pending application Docket  
20 No. 032745-020, and is incorporated herein by reference in its entirety.

Thus, in accordance with the invention, wall and floor coverings having improved properties may be manufactured in an quick and facile manner, which is  
25 economically advantageous. For instance, the impact noise attenuation (e.g. reduced noise propagation from walking a floor) having such a covering and the bridging of cracks are excellent. The materials may adapt well

to changes of the bottom floor or the wall. For example, thermal expansion of floors and crack formation due to stresses are compensated for, so that fissures do not extend to the surface of the covering.

5       The non-woven layer of synthetic organic fibers provides noise attenuation and improved elasticity. On the one hand, noise propagation from the room in which the noise is generated is reduced, and on the other hand, noise generated in the other rooms are muted in  
10 the rooms equipped with floor and wall covering prepared in accordance with the invention. Accordingly, improved insulation within an apartment or apartment building can be provided.

      Furthermore, the layered laminate carrier  
15 manufactured in accordance with the invention, reduces the amount of glass fragments and dust produced, thus avoiding injury to the operator and reducing harm to the environment.

      The formed laminate's thickness can be adjusted  
20 through the hydrodynamic needling method, or optionally through a secondary operation such as compression performed by a calender, a fabric-belt or laminate calender.

25       Furthermore, the product manufactured by the process outlined above provides dimensional stability and eliminates neck-down during coating or saturation PVC or other coating materials.

The invention will be further explained by the example provided below, wherein the carrier in accordance with the invention is manufactured

#### EXAMPLE

5       A glass staple fiber mat with  $13\mu$  glass fibers having an area weight of  $50 \text{ g/m}^2$  was pre-consolidated by a urea resin binder. A  $80 \text{ g/m}^2$  polyester non-woven was manufactured using 2 dtex polyester filaments. The non-woven was heat treated and shrunk in an oven. Both  
10       layers were put together and hydrodynamically needled. The needling took place from the polyester side of the laminate using water jet pressure of 250 bar.

      The maximum tensile load of the laminate was 378 N/5cm at 60 percent elongation in machine direction and  
15       186 N/5cm at 79 percent in cross direction.

      While the invention has been described in detail with reference to specific embodiments thereof, it will be apparent to those skilled in the art that various changes and modifications can be made, and equivalents  
20       employed, without departing from the scope of the claims that follow.